Remote Sensors

Overview

Remote sensing instruments are of two primary types:

- Active sensors, provide their own source of energy to illuminate the objects they observe. An active sensor emits radiation in the direction of the targ to be investigated. The sensor then detects and measures the radiation that is reflected or backscattered from the target.
- Passive sensors, on the other hand, detect natural energy (radiation) that is emitted or reflected by the object or scene being observed. Reflected sunlight is the most common source of radiation measured by passive sensors.

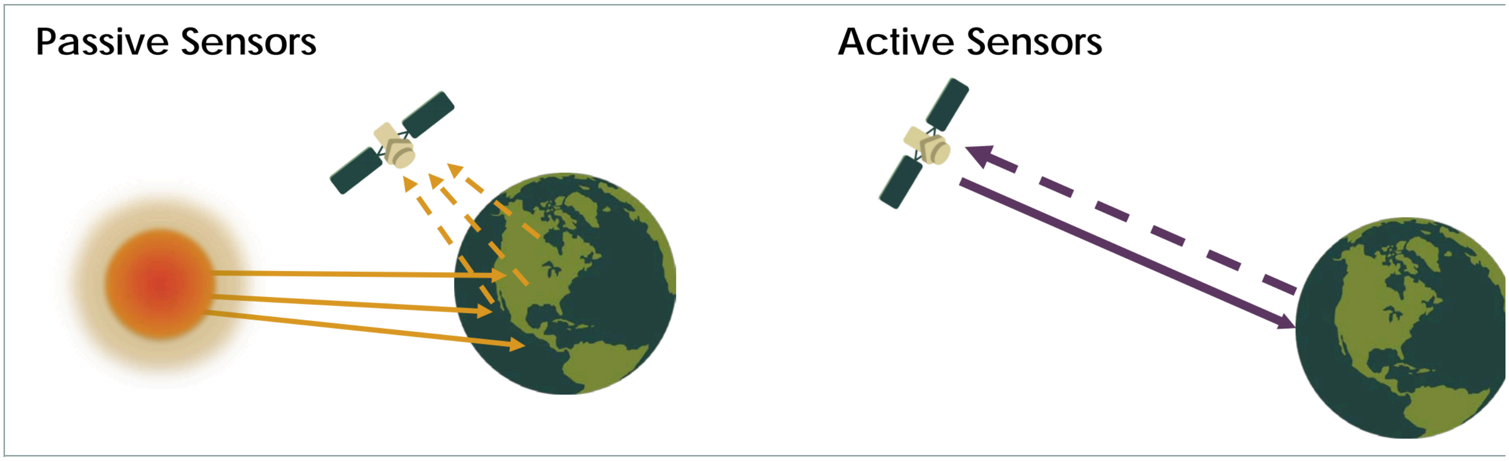

Diagram of a passive sensor versus an active sensor. Credit: NASA Applied Remote Sensing Training Program

The following tables list and describe many of the active and passive sensors whose data are supported by EOSDIS. Some of these sensors may overlap categories. They are listed by **current**, **future**, and **historic** missions.

Search the remote sensors tables by clicking in the search boxes below and entering in a keyword term, such as a DAAC (ASDC, NSIDC, SEDAC, etc), a platform (ABoVE, CALIPSO, LIS ISS, etc), an instrument (GRACE, MODIS, TROPOMI, etc) or science term (surface mass, snow cover, tomography, etc). The search results will narrow down the table entries applicable to the search keyword entered.

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Current Missions

Platform	Sensor Type	Instrument	Type	DAAC	Comments

The Arctic-Boreal Vulnerability Experiment (ABoVE)	Altimeters - Radar and Laser (lidar)		Airborne	ORNL DAAC	ABoVE's science objectives are broadly focused on (1) gaining a better understanding of the vulnerability and resilience of Arctic and boreal ecosystems to environmental change in western North America, and (2) providing the scientific basis for informed decision-makin to guide societal responses at local to international levels Research for ABoVE will link field based, process-level studies with geospatial data products derived from airborne and satellite sensors, providing a foundation for improving the analysis, and modeling capabilities needed to understand and predict ecosystem responses and societal implications.
Airborne Microwave Observatory of Subcanopy and Subsurface (AirMOSS)	Altimeters - Radar and Laser (lidar)	Synthetic Aperture Radar (SAR)	Radar (Active Sensor)	ASF DAAC, ORNL DAAC	P-band Synthetic Aperture Radar (SAR) will provide calibrated polarimetric measurements that will be used t retrieve root-zone soil moisture (RZSM) over the study sites. This is a part of the Earth Ventures 1 (EV-1) programs.
Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO)	Altimeters - Radar and Laser (lidar)	Cloud-Aerosol Lidar with Orthogonal Polarization (CALIOP)	Cloud and Aerosol Lidar (Active Sensor)	ASDC	Two-wavelength polarization-sensitive lidar that provides high-resolution vertical profiles of aerosols and clouds.
Cloud-Aerosol Transport System on the International Space Station (CATS)	Altimeters - Radar and Laser (lidar)	Light Detection and Ranging (lidar)	lidar (Active Sensor)	ASDC	Lidar remote sensing instrument that will provide range-resolved profile measurements of atmospheric aerosols and clouds from the International Space Station (ISS).
Aircraft	Altimeters - Radar and Laser (lidar)	Multiple instruments such as Differential Absorption Lidar (DIAL), Lidar Atmospheric Sensing Experiment (LASE), Doppler radar, NASA Portable S-band Multiparameter Weather Research Radar (NPOL), Shared Mobile Atmospheric Research and Teaching (SMART) Radars, 2nd Generation Precipitation Radar (PR-2) etc.	lidar/radar (Active Sensor)	ASDC, GHRC DAAC	Measures water vapor, aerosols, and clouds throughout the troposphere. These are multiple airborne campaigns on board NASA DC-8 and ER-2 aircraft. Some of those campaigns include the Convection And Moisture EXperiment series 4 (CAMEX-4), Genesis and Rapid Intensification Processes Lidar Atmospheric Sensing Experiment (GRIP LASE), NASA African Monsoon Multidisciplinary Analyses Lidar Atmospheric Sensing Experiment (NAMMA LASE) projects etc.). Thses aircrafts also carry over 30 different sensors on board during thes various airborne campaigns.
Global Ecosystem DynamicsInvestigation (GEDI) on the International Space Station (ISS)	Altimeters - Radar and Laser (lidar)	Light Detection and Ranging (lidar)	lidar (Active Sensor)	LP DAAC, ORNL DAAC	To address these core questions; Quantify the distributionof above-ground carbon at fine spatial resolution; Quantify changes in carbonresulting from disturbance and subsequent recovery; Quantify the spati andtemporal distribution of forest structure and its relationship to habitatquality and biodiversity; Quantify the sequestration potential of foreststhrough time under changing land use and climate.
Global Precipitation Measurement (GPM)	Altimeters - Radar and Laser (lidar)	Dual-Frequency Precipitation Radar (DPR)	Radar (Active Sensor)	GES DISC	Provides next-generation observations of rain and snow worldwide every three hours. Used to unify precipitation measurements made by an international network of partner satellites to quantify when, where, and how much it rains or snows around the world.
Ice, Cloud, and Land Elevation Satellite-2 (ICESat-2)	Altimeters - Radar and Laser (lidar)	Advanced Topographic Laser Altimeter System (ATLAS)	Altimeter (Active Sensor)	NSIDC DAAC	Quantifying polar ice-sheet contributions tocurrent and recent sea-level change, as well as ice-sheet linkages to climate conditions.Quantifying regional patterns of ice-sheet changes to assess whatdrives those changes, and t improve predictive ice-sheet models. Estimatingsea-ice thickness to examine exchanges of energy, mass and moisture between theice, oceans and atmosphere.

					Measuring vegetation canopy height to helpresearchers estimate biomass amounts over large areas, and how the biomass ischanging. Enhancing the utility of other Earth-observation systems throughsupporting measurements.
Operation IceBridge (Airborne)	Altimeters - Radar and Laser (lidar)	Airborne Topographic Mapper (ATM), Land, Vegetation and Ice Sensor (LVIS), UTIG lidar (UTIGL), UAF Airborne Scanning Lidar (UASL)	Altimeter (Active Sensor)	NSIDC DAAC	Largest airborne survey of Earth's polar ice ever flown. Yields a three-dimensional view of Arctic and Antarctic ice sheets, ice shelves, and sea ice. Helps scientists bridge th gap in polar observations between Ice, Cloud,and land Elevation Satellite (ICESat) and ICESat-2.
Operation IceBridge (Airborne)	Altimeters - Radar and Laser (lidar)	Multichannel Coherent Radar Depth Sounder (MCoRDS), Snow Radar (SR), Accumulation Radar (AR), Ku-Band Radar Altimeter (KBRA), High Capability Radar Sounder (HiCARS)	Radar (Active Sensor)	NSIDC DAAC	Largest airborne survey of Earth's polar ice ever flown. Yields a three-dimensional view of Arctic and Antarctic ice sheets, ice shelves, and sea ice. Helps scientists bridge th gap in polar observations between ICESat and ICESat-2.

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Future Missions

Platform	Instrument	Type	DAAC	Comments
Atmospheric Carbon and Transport-America (Act-America)	Multi-Functional Fiber Laser Lidar (MFLL), High-Spectral Resolution Lidar (HSRL), Cloud Physics Lidar (CPL), Picarro spectrometers etc.	lidar, Spectrometer (Active Sensor, Passive Sensor)	ORNL DAAC	To advance society's ability to predict and manage future climate change by providing policy-relevar quantification and understanding of the carbon cycle.
Atmospheric Tomography Mission (ATom)	Balloon Experimental Twin Telescope for Infrared Interferometry (BETTII), NCAR Airborne Oxygen Instrument (AO2), Airborne Tropospheric Hydrogen Oxides Sensor (ATHOS) etc.	Interferometer (Passive Sensor)	ASDC	Identify the important chemical processes that control the short-lived climate forcing agents CH4, O3, and black carbon (BC). Understand how anthropogenic emissions affect the chemical reactivity (the atmosphere on a global scale. Investigate how to improve chemistry climate modeling of these processes. Distribution of BC and other aerosols important as short lived climate forces determine the sources of new particles. Study how rapidly aerosols grow to CCN-active sizes and how well thes processes are represented in models.
Climate Absolute Radiance and Refractivity Observatory (CLARREO)	Infrared Spectrometer (IR)	Spectrometer (Passive Sensor)	ASDC	Provide accurate, credible, and tested climate records that lay the groundwork for informed decisions on mitigation and adaptation policies that address the effects of climate change on societ
Climate Absolute Radiance and		Radio		

Refractivity Observatory (CLARREO)	Radio Occultation (RO)	Occultation (Active Sensor)	ASDC	Provide accurate, credible, and tested climate records that lay the groundwork for informed decisions on mitigation and adaptation policies that address the effects of climate change on societ
Climate Absolute Radiance and Refractivity Observatory (CLARREO)	Reflected Solar Imaging Spectrometer (RS)	Imaging Spectrometer (Passive Sensor)	ASDC	Provide accurate, credible, and tested climate records that lay the groundwork for informed decisions on mitigation and adaptation policies that address the effects of climate change on societ
COral Reef Airborne Laboratory (CORAL)	Portable Remote Imaging Spectrometyer (PRISM)	Imaging Spectrometer (Passive Sensor)	OB.DAAC	A new three-year NASA field expedition will use advanced instruments on airplanes and in the wate to survey more of the world's coral reefs, and in far greater detail, than ever before. The COral Reef Airborne Laboratory (CORAL) will measure the condition of these threatened ecosystems and create a unique database of uniform scale and quality.
The Earth Surface Mineral Dust Source Investigation (EMIT)	Hyperspectral Instruments	Imaging Spectrometer (Passive Sensor)	LPDAAC	The goal of EMIT is to advance understanding of the Earth's mineral dust cycle and its impact on radiative forcing by using state-of-the-art Earth System Models (ESMs) that are initialized with more accurate measurements of mineral dust source region composition.
Geostationary Carbon Observatory (GeoCARB)	TBD	TBD	TBD	GeoCarb will address a number of unanswered questions in carbon cycle science, with a focus on th Americas. For example, to what extent does the Amazonia basin remove carbon dioxide from the atmosphere and store it in forests, and are methane emission estimates over the continental Unite States underestimated?
Joint Polar Satellite System-2 (JPSS-2)	Cross-Track Infrared Sounder(CrIS), Clouds and Earth,Äôs Radiant Energy System (CERES), Visible/Infrared Imager/Radiometer Suite (VIIRS), Advanced Technology Microwave Sounder (ATMS), Ozone Mapping and Profiler Suite (OMPS), Radiation Budget Instrument (RBI)	Radiometer, Sounder (Passive Sensor)	ASDC, GES DISC, LAADS DAAC, LP DAAC, NSIDC DAAC, OB.DAAC	Produce and deliver new satellite data, imagery and products to increase the accuracy and reliabilit of weather forecasting capabilities for severe weather events and phenomena,Äî such as tropical cyclones,Äî i.e., Hurricane Sandy in 2012. Improve our Earth's ocean and coastal applications' use of polar-orbiting satellite data. Continuing the enhancement of our long-term environmental data sets to facilitate long-term climate monitoring and prediction, and Develop our land applications.
Multi-Angle Imager for Aerosols (MAIA)	TBD	TBD	ASDC (TBD)	The mission objective is to determine the relative toxicity of various particulate matter components and to assess the effects of particle size and composition on adverse birth outcomes, cardiovascula and respiratory disease, and premature death.

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Historic Missions

Platform	Instrument	Type	DAAC	Comments
Active Cavity Radiometer Irradiance Monitor Satellite (ACRIMSAT)	Active Cavity Radiometer Irradiance Monitor (ACRIM III)	Total Power Radiometer (Passive Sensor)	ASDC	The purpose of the Active Cavity Radiometer Irradiance Monitor III (ACRIM III) instrument is to stud total solar irradiance from the Sun. The ACRIM III package is flying on a spacecraft called ACRIMSAT ACRIMSAT data will be correlated with possible global warming data, ice cap shrinkage data, and O layer depletion data.
Advanced Land Observing Satellite (ALOS)	Phased Array L-band Synthetic Aperture Radar (PALSAR)	Radar (Active Sensor)	ASF DAAC	Developed to contribute to the fields of mapping, precise regional land-coverage observation, disaster monitoring, and resource surveying. ALOS was a mission of the Japan Aerospace Exploration Agency (JAXA).
Advanced Land Observing Satellite (ALOS)	Panchromatic Remote Sensing Instrument for Stereo Mapping (PRISM)	Spectrometer (Passive Sensor)	ASF DAAC	Panchromatic radiometer with 2.5m spatial resolution that provides highly accurate digital surface model (DSM).
Advanced Land Observing Satellite (ALOS)	Advanced Visible and Near Infrared Radiometer type 2 (AVNIR-2)	Radiometer (Passive Sensor)	ASF DAAC	AVNIR-2 is a successor to AVNIR that was on board the Advanced Earth Observing Satellite (ADEOS) which was launched in August 1996.
Advanced Earth Observing Satellite (ADEOS)	Total Ozone Mapping Spectrometer (TOMS)	Spectrometer (Passive Sensor)	GES DISC	First international space platform dedicated to Earth environmental research, focused on global warming, depletion of the ozone layer, and deforestation. Launched in August 1996 and ceased to operate in June 1997.
Advanced Earth Observing Satellite (ADEOS)	Wind Scatterometer (SCAT)	Radar Scatterometer (Active Sensor)	PO.DAAC	Dual Fan-Beam Ku Band that measures ocean vector winds at a nominal grid resolution of 25 km.
Advanced Earth Observing Satellite (ADEOS II)	Advanced Microwave Scanning Radiometer	Scanning Radiometer (Passive Sensor)	NSIDC DAAC	The ADEOS-II mission was operational for only 10 months - when an anomaly stopped all further operations on Oct. 24, 2003. Indeed a great loss in Earth observations for Japan and its partners as well as for the entire Earth observation community.
Advanced Earth Observing Satellite (ADEOS II)	SeaWinds	Scatterometer (Active Sensor)	NSIDC DAAC, PO.DAAC	>SeaWinds is a part of the Earth Observing System (EOS) which is designed to address global environmental changes, and is a joint mission with the National Space Development Agency ofJapa (NASDA).
Airborne Synthetic Aperture Radar (AIRSAR)	Airborne Synthetic Aperture Radar (AIRSAR)	Radar (Active Sensor)	ASF DAAC, NSIDC DAAC	All-weather imaging tool able to penetrate through clouds and collect data at night. The longer wavelengths can also penetrate into the forest canopy and in extremely dry areas, through thin sand cover and dry snow pack.
Satv©lite de Aplicaciones Cientv≠ficas (SAC)-D (Aquarius)	L-band radiometer (LBR), L-band scatterometer (LBS)	Radiometer, Scatterometer (Passive Sensor, Active Sensor)	OB.DAAC, PO.DAAC	Instrument that was aboard the Argentine *Satv©lite de Aplicaciones Cientv≠ficas-D* (SAC-D) spacecraft. It measured global sea surface salinity to better predict future climate conditions. SAC- suffered a power supply failure in June 2015, ending the mission.

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